

**- INTERIOR -
TESTING SERVICES
- LTD. -**

**MATERIALS TESTING • SOILS
CONCRETE • ASPHALT • CORING
GEOTECHNICAL ENGINEERING**

**1 - 1925 KIRSCHNER ROAD
KELOWNA, B.C. V1Y 4N7
PHONE: 860-6540
FAX: 860-5027**

District of Summerland
9215 Cedar Avenue
PO Box 159
Summerland, BC V0H 1Z0

July 27, 2016
Job 16.168

Attention: Ms Chandra Moncrieff – Engineering Technologist

Dear Ms;

Re: **Geotechnical Report
Proposed Lift Station Building
14877 Lakeshore Road South
Summerland, BC**

As requested and further to our proposal of June 29, 2016, Interior Testing Services Ltd (ITSL) has carried out a geotechnical investigation for the above noted proposed lift station structure. Please find attached a one page site plan with schematic logs and an auger hole log.

At the end of this report, please see attached a copy of our standard two-page "Terms of Engagement" that governs our work, previously accepted and signed.

1.0 INTRODUCTION & FIELD WORK

We understand that to reduce the odour of the lift station to the surrounding recreational area, a structure is proposed to be constructed around the lift station. As per our proposal, we understand the future structure is roughly 5 by 3 m in plan area and will likely be set on conventional strip footings.

Given the possibility of fill material at the subgrade level, from the installation of the lift station, a geotechnical investigation was carried out. The purpose of our investigation was to review the underlying soil and groundwater conditions with respect to general geotechnical comments for design and construction of the proposed structure.

On July 13, 2016 a truck mounted drill rig operated by Mud Drilling Co Ltd was used to advance one auger hole to roughly 7.6 m below site grade. The soil profile was continuously logged in the field and occasional, representative samples were recovered and returned to our laboratory for additional analysis.

In addition, a single Dynamic Cone Penetration Test (DCPT) was carried out to assess the in-situ density of the soil profile. DCPT results are comparable to Standard Penetration 'N' values, commonly used in geotechnical design.

Locations of the auger holes were referenced to existing landmarks and are shown on the attached site plan (Drawing 16.168-1) provided by the District of Summerland. The elevation of the auger hole was not obtained due to the general flatness of the overall site.

2.0 RESULTS

2.1 Soil Profile & DCPT

The schematic logs of the auger hole are shown on Drawing 16.168-1. Detailed soil descriptions are shown on the attached auger hole log (Drawings 16.168-2), which should be used in preference to the generalized soil descriptions that follow.

Roughly 1 m of sand and gravel FILL was encountered, underlain by natural SANDs and GRAVELs to approximately 3.5 m below grade. Natural SILTs and SANDs were then encountered to the base of the test hole at 7.6 m.

As noted above, a single DCPT was advanced adjacent to AH1. The results (Drawing 16.168) indicate loose to dense soil conditions throughout the soil profile. The surface gravel FILL appeared to be in a dense condition, with blow counts ranging from 30 to 58 blows per 300 mm.

2.2 Groundwater Conditions

During our investigation of July 13, 2016 groundwater was observed at roughly 1.5 m below grade. As a general comment, groundwater levels will likely fluctuate seasonally and may be affected by drainage and infiltration conditions.

3.0 SITE PREPARATION & FOUNDATION DESIGN

3.1 Site Preparation

Assuming a strip footing working load of roughly 14.5 kN per lineal metre (1000 lbs per lineal foot) and using the DCPT results from our investigation, we anticipate that long-term static settlement will be within normal geotechnical objectives, roughly 25 mm. However, considering that ITSL only has limited information on the FILL, there remains some risk of localized settlement beyond normal objectives, particularly if the FILL becomes saturated. Assuming that some risk of localized settlement is acceptable, the existing sand and gravel FILL appears to be suitable for building support.

We recommend that any surface topsoils, buried structures etc be removed from the building area to expose the existing sand and gravel FILL.

The existing sand and gravel FILL should be compacted to at least 98% of Standard Proctor Density (SPD). Field density testing is to be carried out to confirm that adequate compaction has been achieved. An allowance to provide roughly 300 mm of crushed gravel also appears to be prudent.

If the low risk of localized settlement is not acceptable, please advise and additional guidance can be provided.

3.2 Foundation Design

Provided that bearing surfaces consist of adequately compacted sand and gravel FILL, an allowable bearing pressure of 100 kPa (2000 psf) could be assumed for design purposes, subject to the following considerations.

- a) Bearing surfaces to be clean, dry and in a well compacted condition.
- b) Minimum footing width to be 400 mm (16 inches).
- c) Footing depth be at least 600 mm (24 inches) below surrounding grade or as per local bylaw, for frost protection purposes.

The above noted allowable bearing pressure can also be taken as the Service Limit State (SLS) pressure. The factored bearing resistance at the Ultimate Limit State (ULS) condition can be taken as 300 kPa (6000 psf) using a geotechnical resistance factor of 0.5 (Table 8.2 – Canadian Foundation Engineering Manual 4th Ed).

4.0 SEISMIC SITE CLASS

Based on the results of our investigation and our experience within the surrounding area, we are anticipating generally compact SAND / SILT soils to depth. From these results and our general experience in the area, Site Class D as taken from the 2012 BC Building Code table 4.1.8.4.A appears to be appropriate for seismic design purposes of the proposed lift station structure.

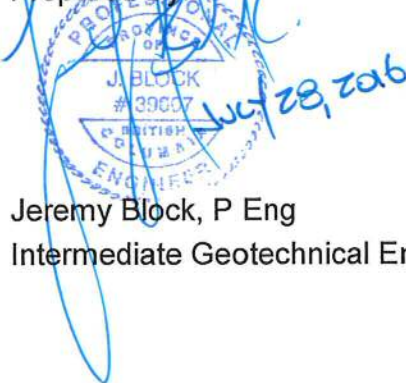
5.0 CONCLUSIONS

- 5.1 Recommendations for site preparation and foundation design are provided above. Provided the low risk of localized settlement is acceptable, the existing gravel FILL appears to be suitable for foundation support.
- 5.2 If required, ITSL can carry out a geotechnical review at the time of construction and provide further comment.

We trust the above comments are sufficient at this stage. After your review, please feel free to call and discuss if you have any questions.

Sincerely,
Interior Testing Services Ltd

Prepared By:

A circular professional engineer seal for the Province of British Columbia. The seal contains the text "PROFESSIONAL ENGINEER", "PROVINCE OF BRITISH COLUMBIA", and "J. BLOCK #39007". There is a blue ink signature over the seal and the handwritten text "w/ 28, 2ab" in blue ink to the right of the seal.

J. BLOCK
#39007
w/ 28, 2ab

Jeremy Block, P Eng
Intermediate Geotechnical Engineer

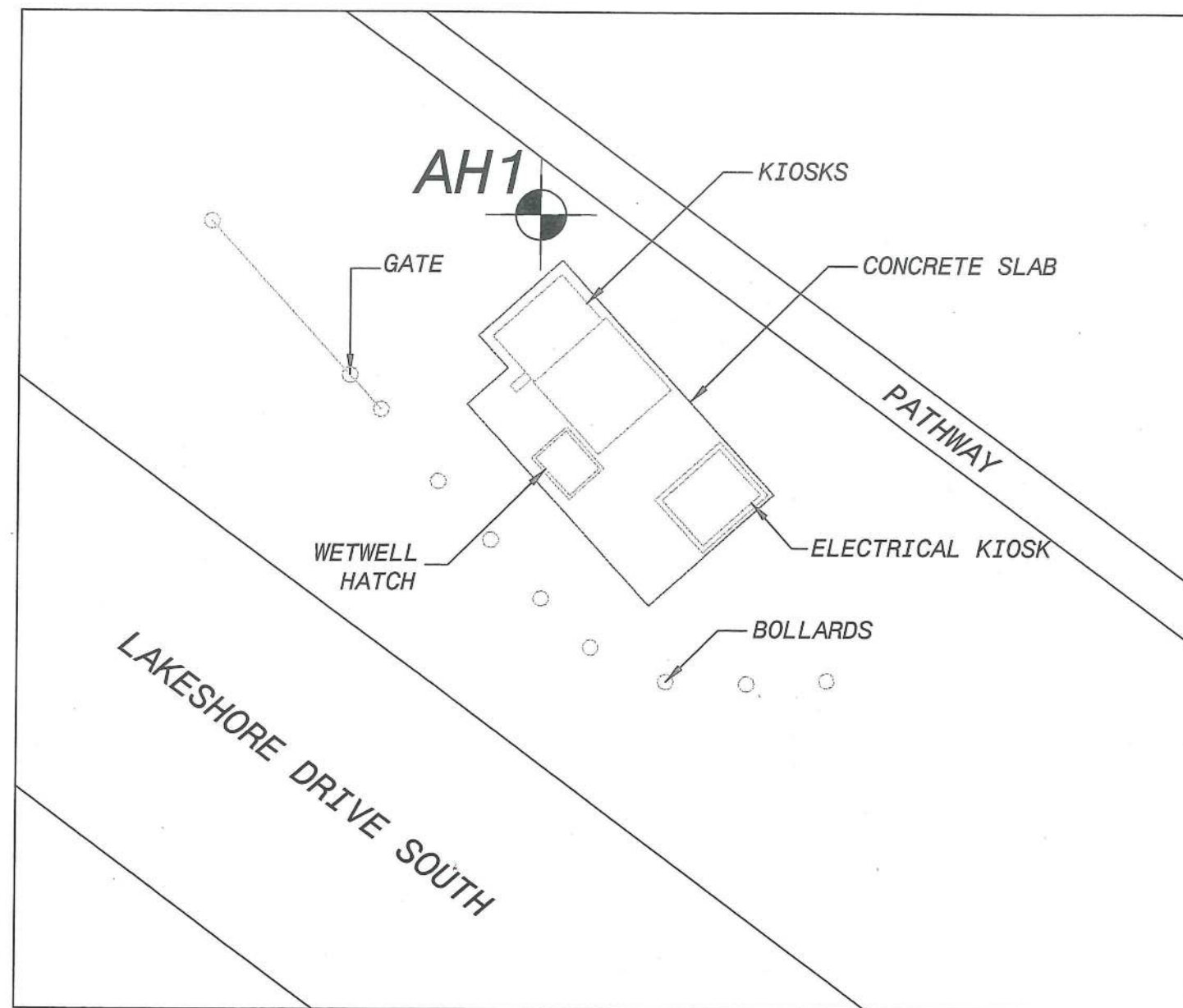
Reviewed By:

A circular professional engineer seal for the Province of British Columbia. The seal contains the text "PROFESSIONAL ENGINEER", "PROVINCE OF BRITISH COLUMBIA", and "P.R. HANENBURG #18012". There is a blue ink signature over the seal.

P.R. HANENBURG
#18012

Peter Hanenburg P Eng
Principal Geotechnical Engineer

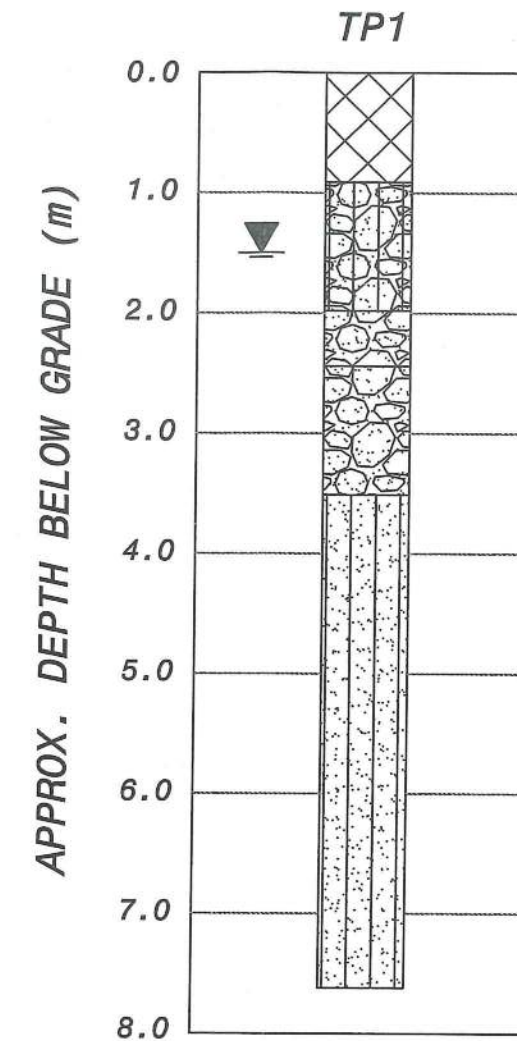
SITE PLAN



SCALE 1:100



SCHEMATIC LOGS



LEGEND



FILL



SAND, GRAVEL AND COBBLE



GRAVEL, COBBLE AND SILT/SAND



SILTY SAND, SANDY SILT OR SILT/SAND



AUGER HOLE LOCATION



WATER NOTED DURING DRILLING (July 13/16)

NOTES

1. REFERENCE PLAN SUPPLIED BY THE DISTRICT OF SUMMERLAND.
2. AUGER HOLE LOCATION IS APPROXIMATE AND MAY VARY FROM THAT SHOWN.
3. FOR DETAILED SOIL DESCRIPTIONS REFER TO AUGER HOLE LOG.

DISTRICT OF SUMMERLAND

GEOTECHNICAL INVESTIGATION
LIFT STATION BUILDING
14877 LAKESHORE ROAD
DISTRICT OF SUMMERLAND, B.C.

SITE PLAN

INTERIOR TESTING SERVICES LTD.

1-1925 KIRSCHNER ROAD, KELOWNA, BC V1Y 4N7
PH: 250-860-6540 EM: info@interiortesting.com

DATE OF INVESTIGATION: July 13, 2016

JOB NUMBER: 16.168

DRAWING NUMBER: 16.168-1

**- INTERIOR -
TESTING SERVICES
- LTD. -**

LOG OF AUGER HOLE 1

Interior Testing Services Ltd.
1 - 1925 Kirschner Road
Kelowna, BC V1Y 4N7
(250) 860 - 6540
email: info@interiortesting.com

Project	: 16.168	Method	: Tracked Drill Rig
	: Lift Station Building	Excavator	: Mud Bay
	: 14877 Lakeshore Road	Logged By	: MT
	: District of Summerland	Date	: July 13, 2016
Location	: See Dwg. No. 16.168-1		

Legend

- | | |
|----------------------------|--------------------|
| Water Noted During Digging | Disturbed Sample |
| Water Noted in Piezometer | Undisturbed Sample |
| | L.L. Liquid Limit |
| | P.L. Plastic Limit |

DESCRIPTION

Depth in Meters

% Moisture or
Blows / 300 mm

Blows / 300 mm

Water Level

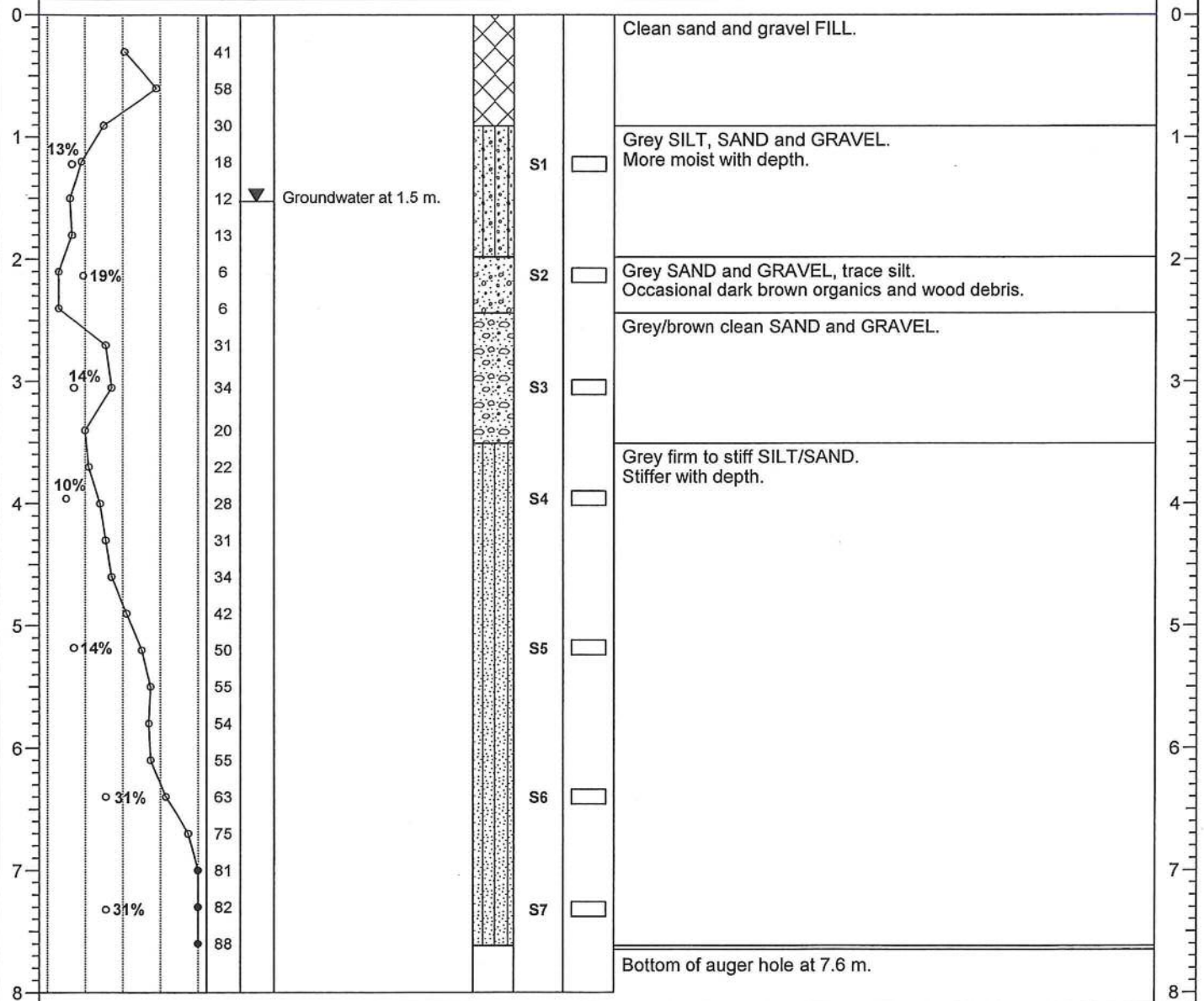
REMARKS

GRAPHIC

Sample Number

Sample Type

Depth in Meters



TERMS OF ENGAGEMENT

GENERAL

Interior Testing Services Ltd. (ITSL) shall render the Services performed for the Client on this Project in accordance with the following Terms of Engagement. ITSL may, at its discretion and at any stage, engage subconsultants to perform all or any part of the Services. Unless specifically agreed in writing, these Terms of Engagement shall constitute the entire Contract between ITSL and the Client.

COMPENSATION

Charges for the Services rendered will be made in accordance with ITSL's Schedule of Fees and Disbursements in effect from time to time as the Services are rendered. All Charges will be payable in Canadian Dollars. Invoices will be due and payable by the Client within thirty (30) days of the date of the invoice without hold back. Interest on overdue accounts is 12% per annum.

REPRESENTATIVES

Each party shall designate a representative who is authorized to act on behalf of that party and receive notices under this Agreement.

TERMINATION

Either party may terminate this engagement without cause upon thirty (30) days' notice in writing. On termination by either party under this paragraph, the Client shall forthwith pay ITSL its Charges for the Services performed, including all expenses and other charges incurred by ITSL for this Project.

If either party breaches this engagement, the non-defaulting party may terminate this engagement after giving seven (7) days' notice to remedy the breach. On termination by ITSL under this paragraph, the Client shall forthwith pay to ITSL its Charges for the Services performed to the date of termination, including all fees and charges for this Project.

ENVIRONMENTAL

ITSL's field investigation, laboratory testing and engineering recommendations will not address or evaluate pollution of soil or pollution of groundwater. ITSL will co-operate with the Client's environmental consultant during the field work phase of the investigation.

PROFESSIONAL RESPONSIBILITY

In performing the Services, ITSL will provide and exercise the standard of care, skill and diligence required by customarily accepted professional practices and procedures normally provided in the performance of the Services contemplated in this engagement at the time when and the location in which the Services were performed. ITSL makes no warranty, representation or guarantee, either express or implied as to the professional services rendered under this agreement.

LIMITATION OF LIABILITY

ITSL shall not be responsible for:

- (a) the failure of a contractor, retained by the Client, to perform the work required in the Project in accordance with the applicable contract documents;
- (b) the design of or defects in equipment supplied or provided by the Client for incorporation into the Project;
- (c) any cross-contamination resulting from subsurface investigations;
- (d) any damage to subsurface structures and utilities;
- (e) any Project decisions made by the Client if the decisions were made without the advice of ITSL or contrary to or inconsistent with ITSL's advice;
- (f) any consequential loss, injury or damages suffered by the Client, including but not limited to loss of use, earnings and business interruption;
- (g) the unauthorized distribution of any confidential document or report prepared by or on behalf of ITSL for the exclusive use of the Client.

The total amount of all claims the Client may have against ITSL under this engagement, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to the lesser of our fees or \$50,000.00.

No claim may be brought against ITSL in contract or tort more than two (2) years after the Services were completed or terminated under this engagement.

PERSONAL LIABILITY

For the purposes of the limitation of liability provisions contained in the Agreement of the parties herein, the Client expressly agrees that it has entered into this Agreement with ITSL, both on its own behalf and as agent on behalf of its employees and principals.

The Client expressly agrees that ITSL's employees and principals shall have no personal liability to the Client in respect of a claim, whether in contract, tort and/or any other cause of action in law. Accordingly, the Client expressly agrees that it will bring no proceedings and take no action in any court of law against any of ITSL's employees or principals in their personal capacity.

THIRD PARTY LIABILITY

This report was prepared by ITSL for the account of the Client. The material in it reflects the judgement and opinion of ITSL in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ITSL accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report may not be used or relied upon by any other person unless that person is specifically named by us as a beneficiary of the Report. The Client agrees to maintain the confidentiality of the Report and reasonably protect the report from distribution to any other person.

INDEMNITY

The client shall indemnify and hold harmless ITSL from and against any costs, damages, expenses, legal fees and disbursements, expert and investigation costs, claims, liabilities, actions, causes of action and any taxes thereon arising from or related to any claim or threatened claim by any party arising from or related to the performance of the Services.

DOCUMENTS

All of the documents prepared by ITSL or on behalf of ITSL in connection with the Project are instruments of service for the execution of the Project. ITSL retains the property and copyright in these documents, whether the Project is executed or not. These documents may not be used on any other project without the prior written agreement of ITSL.

FIELD SERVICES

Where applicable, field services recommended for the Project are the minimum necessary, in the sole discretion of ITSL, to observe whether the work of a contractor retained by the Client is being carried out in general conformity with the intent of the Services.

DISPUTE RESOLUTION

If requested in writing by either the Client or ITSL, the Client and ITSL shall attempt to resolve any dispute between them arising out of or in connection with this Agreement by entering into structured non-binding negotiations with the assistance of a mediator on a without prejudice basis. The mediator shall be appointed by agreement of the parties. If a dispute cannot be settled within a period of thirty (30) calendar days with the mediator, the dispute shall be referred to and finally resolved by an arbitrator appointed by agreement of the parties.

CONFIRMATION OF PROFESSIONAL LIABILITY INSURANCE

As required by by-laws of the Association of Professional Engineers and Geoscientists of British Columbia, it is required that our firm advises whether or not Professional Liability Insurance is held. It is also required that a space for you to acknowledge this information be provided.

Our professional liability insurance is not project specific for the project and should not be regarded as such. If you require insurance for your project you should purchase a project specific insurance policy directly.

Accordingly, this notice serves to advise you that ITSL carries professional liability insurance. Please sign and return a copy of this form as an indication of acceptance and agreement to the contractual force of these Terms of Engagement.

ACKNOWLEDGEMENT: _____